VALERO
Benicia Refinery • Valero Refining Company - California
3400 East Second Street • Benicia, California 94510-1097 • Telephone (707) 745-7011 • Facsimile (707) 745-7339

Certified Mail # 7015 1520 0001 6225 2986

June 1, 2017

Cal-OES Section 304 Report
SO2 Emissions
Cal-OES Control No. 17-3238

Attn: Section 304 Reports
Hazardous Materials Unit
California Office of Emergency Services (CAL-OES)
State Emergency Response Commission (SERC)
3650 Schriever Avenue
Mather, CA 95655

Dear Reader:

Enclosed is the Emergency Release Follow-up Notice Reporting Form (Cal-OES Section 304 Report) regarding the May 5, 2017 report of the release of Sulfur Dioxide (SO2) and Carbonyl Sulfide (COS) in excess of the EPCRA Reportable Quantity (RQ) at the Valero Refining Company – California, (Valero) Benicia Refinery. This follow-up report provides updated information that was initially submitted by telephone on May 5, 2017 through May 18, 2017 for the immediate event notification to the Cal-OES.

The following information is provided to update the immediate notification to CA-OES:

- The time and duration of the release.
  - SO2 release: the release occurred beginning May 5, 2017 (6:00) through May 18, 2017 (13:00). Duration of the release: 13 days, 7 hours.

    Emissions are based on flare gas sulfur analyzers compliant with NSPS Subpart Ja. Initial reporting is always in an abundance of caution and subsequent review of data can cause the emissions initially reported to be updated.

    24-Hour SO2 Release Quantity

Start Date/Time	End Date/Time	Release Qty (# SO2)
May 5, 2017 (6:00 am)	May 5, 2017 (11:59 pm)	31,268
May 6, 2017 (12:00 am)	May 6, 2017 (11:59 pm)	7,044
May 7, 2017 (12:00 am)	May 7, 2017 (11:59 pm)	17,756

May 8, 2017 (12:00 am)	May 8, 2017 (11:59 pm)	29
May 9, 2017 (12:00 am)	May 9, 2017 (11:59 pm)	191
May 10, 2017 (12:00 am)	May 10, 2017 (11:59 pm)	26
May 11, 2017 (12:00 am)	May 11, 2017 (11:59 pm))	180
May 12, 2017 (12:00 am)	May 12, 2017 (11:59 pm)	261
May 13, 2017 (12:00 am)	May 13, 2017 (11:59 pm)	2,471
May 14, 2017 (12:00 am)	May 14, 2017 (11:59 pm)	7,884
May 15, 2017 (12:00 am)	May 15, 2017 (11:59 pm)	2,504
May 16, 2017 (12:00 am)	May 16, 2017 (11:59 pm)	2,884
May 17, 2017 (12:00 am)	May 17, 2017 (11:59 pm)	1,560
May 18, 2017 (12:00 am)	May 18, 2017 (1:59 pm)	362
	Total	**74,420**

- COS release: the release occurred beginning May 12, 2017 (5:00am) through May 15, 2017 (2:00pm). Duration of the release: 2 days, 9 hours. Cumulative COS emissions did not exceed the RX (100 pounds) until May 13, 2017 (05:00am). Emissions are based on stack analyzer data.

24-Hour COS Release Quantity

Start Date/Time	End Date/Time	Release Qty (# COS)
May 12, 2017 (5:00 am)	May 12, 2017 (11:59 pm)	78
May 13, 2017 (5:00 am)	May 13, 2017 (11:59 pm)	110
May 14, 2017 (12:00 am)	May 14, 2017 (11:59 pm)	106
May 15, 2017 (12:00 am)	May 15, 2017 (2:00 pm)	57
	Total	**351**

- The medium or media into which the release occurred.

  The SO2 and COS release occurred to the air.

- Any known or anticipated acute or chronic health risks associated with the emergency and, where appropriate, advice regarding medical attention necessary for exposed individuals.

  No acute or chronic effects expected based on quantity and location of release (see attached SDS' for SO2 and COS).

- Proper precautions to take as a result of the release, including evacuation (unless such information is readily available to the community emergency coordination pursuant to the emergency plan).

  Evacuation of the Benicia Industrial Park was conducted during a portion of May 5, 2017. The incident was also reported to the City of Benicia Fire Department, the Solano County Department of Resource Management, Environmental Health Division, and the Bay Area Air Quality Management District.

- The names and telephone number of the person or persons to be contacted for further information.

  Contact Lisa Crowley at (707) 745-7925.

Regarding 40 CFR Part 355 Subpart C §355.40(b)(3), the following additional information is provided in the attached Seven Day Report:

- Actions taken to respond to and contain the release.

  Operational adjustments were made to minimize emissions.

- Any known or anticipated acute or chronic health risks associated with the release

  See attached SDS

- Where appropriate, advice regarding medical attention necessary for exposed individuals.

  See attached SDS

Please contact me at 707-745-7545 if you have any questions regarding this Seven Day Report and/or CA-OES immediate notification updates or need additional information.

Sincerely,

Donald W. Cuffel, Director
Health, Safety & Environmental and
Governmental Affairs

DWC/EMC/tac

Enclosures

cc:

Certified Mail: 7015 1520 0001 6225 2993
Mr. Colby LaPlace
Solano County CUPA (LEPC)
Solano County Dept. of Resource Management
675 Texas Street, Suite 5500
Fairfield, CA 94533

EMERGENCY RELEASE FOLLOW-UP REPORTING FORM (SECTION 304 REPORT)

A

BUSINESS NAME: **Valero Refining Company - California**

FACILITY EMERGENCY CONTACT & PHONE NUMBER: **Iren Suhami (707) 745-1635**

B

INCIDENT DATE: MO **0 5** DAY **0 9** YR **1 7**

TIME OES NOTIFIED: **1 1 2 5** (use 24 hr time)

OES CONTROL NO.: **1 7 3 2 3 8**

C

INCIDENT ADDRESS LOCATION: **3400 E. Second Street**

CITY/COMMUNITY: **Benicia**

COUNTY: **Solano**

ZIP: **94510**

D

CHEMICAL OR TRADE NAME (print or type): **Carbonyl Sulfide**

CAS Number: **463-58-1**

CHECK IF CHEMICAL IS LISTED IN 40 CFR 355, APPENDIX A: [X]

CHECK IF RELEASE REQUIRES NOTIFICATION UNDER 42 U.S.C. Section 9603 (a): [X]

PHYSICAL STATE CONTAINED: [ ] SOLID [ ] LIQUID [X] GAS

PHYSICAL STATE RELEASED: [ ] SOLID [ ] LIQUID [X] GAS

QUANTITY RELEASED: **351 pounds**

ENVIRONMENTAL CONTAMINATION: [X] AIR [ ] WATER [ ] GROUND [ ] OTHER

TIME OF RELEASE: 5/13/17 0500 hours

DURATION OF RELEASE: **2** DAYS **9** HOURS **0** MIN

E

ACTIONS TAKEN

Operations were monitored and adjusted to minimize release to the extent possible.

F

KNOWN OR ANTICIPATED HEALTH EFFECTS (Use the comments section for additional information)

[ ] ACUTE OR IMMEDIATE (explain) _____

[ ] CHRONIC OR DELAYED (explain) _____

[X] NOT KNOWN (explain) **No acute or chronic effects expected based on quantity and location of release (see attached MSDS).**

G

ADVICE REGARDING MEDICAL ATTENTION NECESSARY FOR EXPOSED INDIVIDUALS

Not applicable - see comments below.

H

COMMENTS (INDICATE SECTION (A - G) AND ITEM WITH COMMENTS OR ADDITIONAL INFORMATION)

B. OES notified on 5/9/17, based on preliminary data and abundance of caution.

D. Further review of data indicates that event and RQ excess did not occur until 05/13/17 0500 hrs - 05/15/17 1400 hrs

G. (see attached MSDS for Carbonyl Sulfide)

I

CERTIFICATION: I certify under penalty of law that I have personally examined and I am familiar with the information submitted and believe the submitted information is true, accurate, and complete.

REPORTING FACILITY REPRESENTATIVE (print or type): **D. W. Cuffel**

SIGNATURE OF REPORTING FACILITY REPRESENTATIVE: D W Cuffel DATE: 5/31/17

EMERGENCY RELEASE FOLLOW-UP REPORTING FORM (SECTION 304 REPORT)

A

BUSINESS NAME: **Valero Refining Company - California**

FACILITY EMERGENCY CONTACT & PHONE NUMBER: **Kimberly Ronan at (707) 745-7990**

B

INCIDENT DATE: MO **0 5** DAY **0 5** YR **1 7**

TIME OES NOTIFIED: **0 7 0 5** (use 24 hr time)

OES CONTROL NO.: **1 7 3 2 3 8**

C

INCIDENT ADDRESS LOCATION: **3400 E. Second Street**

CITY/COMMUNITY: **Benicia**

COUNTY: **Solano** ZIP: **94510**

D

CHEMICAL OR TRADE NAME (print or type): **Sulfur Dioxide**

CAS Number: **7446-09-5**

CHECK IF CHEMICAL IS LISTED IN 40 CFR 355, APPENDIX A: [X]

CHECK IF RELEASE REQUIRES NOTIFICATION UNDER 42 U.S.C. Section 9603 (a): [X]

PHYSICAL STATE CONTAINED: [ ] SOLID [ ] LIQUID [X] GAS

PHYSICAL STATE RELEASED: [ ] SOLID [ ] LIQUID [X] GAS

QUANTITY RELEASED: **74,420 pounds**

ENVIRONMENTAL CONTAMINATION: [X] AIR [ ] WATER [ ] GROUND [ ] OTHER

TIME OF RELEASE: **0 6 4 2**

DURATION OF RELEASE: **13** DAYS **6** HOURS **56** MIN

E

ACTIONS TAKEN

Operations were monitored and adjusted to minimize flaring to the extent possible.

F

KNOWN OR ANTICIPATED HEALTH EFFECTS (Use the comments section for additional information)

[ ] ACUTE OR IMMEDIATE (explain)

[ ] CHRONIC OR DELAYED (explain)

[X] NOT KNOWN (explain) **No acute or chronic effects expected based on quantity and location of release (see attached MSDS).**

G

ADVICE REGARDING MEDICAL ATTENTION NECESSARY FOR EXPOSED INDIVIDUALS

Not applicable - see comments below.

H

COMMENTS (INDICATE SECTION (A - G) AND ITEM WITH COMMENTS OR ADDITIONAL INFORMATION)

FOR SO2:

This notice is provided pursuant to the requirements of 42 U.S.C. Sec. 9603 (a):

Notification pursuant to 42 U.S.C. Sec. 11004 does not apply because, based on our off-site ground level SO2 monitors surrounding our facility, which did not indicate an increase in ambient SO2 concentrations as a result of this release, exposure from the release was limited to persons solely within the site or sites on which a facility is located.

I

CERTIFICATION: I certify under penalty of law that I have personally examined and I am familiar with the information submitted and believe the submitted information is true, accurate, and complete.

REPORTING FACILITY REPRESENTATIVE (print or type): **D. W. Cuffel**

SIGNATURE OF REPORTING FACILITY REPRESENTATIVE: D.W. Cuffel DATE: 5/31/12

INTERNAL USE ONLY MSDS

NFPA	HCS Risk Phrases	Protective Clothing
	**HCS CLASS: Highly toxic.** **HCS CLASS: Flammable gas.** **HCS CLASS: HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH THE SKIN.**	

Section I. Chemical Product and Company Identification

Common Name/ Trade Name	**Carbonyl Sulfide**
Manufacturer	**VALERO MARKETING & SUPPLY COMPANY and Affiliates P.O. Box 696000 San Antonio, TX 78269-6000**
Synonym	Carbon Oxysulfide, Carbon Oxide Sulfide, Oxycarbon Sulfide, Carbon Oxygen Sulfide
Chemical Name	Carbonyl Sulfide
Chemical Family	Not available.
Chemical Formula	COS
Material Uses	Not available.

MSDS #	**00434**
CAS#	463-58-1

Emergency Phone Numbers:	Port Arthur Refinery Emergency Phone (409) 985-2200 or X-2200
General Assistance:	Port Arthur Refinery Shift Supv. X-1738 or X-1265 Port Arthur Refinery MSDS Info: (409)985-1240 or X-1200

Section II.Composition and Information on Ingredients

Name	CAS #	% Comp	TLV/PEL	LC_{50}/LD_{50}
1) Carbonyl Sulfide	463-58-1	100	Not available.	**ORAL (LD50)** mg/kg: Acute: 23 (Rat). **GAS (LC50)** ppm : Acute: 1110 (Rat) (4 hour(s)).

Section III. Hazards Identification

Potential Acute Health Effects	Product can irritate or even burn the skin and eyes. Contact with the liquified gas could cause frostbite. Breathing Carbonyl Sulfide can irritate the nose, throat, and lungs causing cough and sneezing. High exposures causes salivation, nausea, vomiting, diarrhea, sweating, weakness, and muscle cramps. It may cause the heart to beat fast (tachycardia) or irregularly (arrhythmia. Headache, dizziness, confusion, passing out and even death can occur.
Potential Chronic Health Effects	Repeated exposure may cause brain damage. Effects could include reduced memory, inability to concentrate and/or personality changes (e.g., irritability). Carbonyl Sulfide may cause damage to the liver. Repeated exposure may increase blood cholesterol and increase risk of cholesterol and fatty deposits in blood vessels (hardening of the arteries).

Section IV. First Aid Measures

Eye Contact	Check for and remove any contact lenses. IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. COLD water may be used. DO NOT use an eye ointment. Seek medical attention.
Skin Contact	If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical touches the victim's exposed skin, such as the hands: Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. If irritation persists, seek medical attention.
Hazardous Skin Contact	Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. In case of contact with liquefied gas, thaw frosted parts with lukewarm water. Keep victim warm and quiet. Seek immediate medical attention.
Inhalation	Allow the victim to rest in a well ventilated area. Seek immediate medical attention

Continued on Next Page

Hazardous Inhalation	If fumes are still suspected to be present, the rescuer should WEAR AN APPROPRIATE MASK OR A SELF-CONTAINED BREATHING APPARATUS. Evacuate the victim to a safe area as soon as possible. If the victim is breathing, check for unusual breath odors. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Maintain an open airway. **WARNING: It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, Do Not** use mouth-to-mouth method if victim ingested or inhaled the substance;induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Seek immediate medical attentior
Ingestion	**Since the product is a gas and it is most likely that it will be inhaled rather than ingested, please consider first to look at the preventive measures in case of inhalation.**
Hazardous Ingestion	No additional information.

Section V. Fire and Explosion Data

Flammability of the Product	Flammable.
Auto-Ignition Temperature	Not available.
Flash Points	Not available.
Flammable Limits	LOWER: 12% UPPER: 29%
Products of Combustion	May liberate highly toxic Hydrogen Sulfide gas upon decomposition.
Fire Hazards in Presence of Various Substances	Extremely flammable in presence of open flames and sparks, of heat, of oxidizing materials.
Explosion Hazards in Presence of Various Substances	Extremely explosive in presence of heat, of oxidizing materials. Slightly explosive to explosive in presence of open flames and sparks.
Fire Fighting Media and Instructions	Poisonous gas. Flammable gas. SMALL FIRE: Use DRY chemicals, CO2, alcohol foam or water spray. LARGE FIRE: Use water spray, fog or foam. DO NOT use water jet. Move containing vessels from fire area if without risk. Cool containing vessels with flooding quantities of water until well after fire is out. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion. Withdraw immediately in case of a rising sound form venting safety devices or discoloration of the vessel. DO NOT extinguish a leaking gas flame unless leak can be stopped. Extinguish secondary fire.
Special Remarks on Fire Hazards	No additional remark.
Special Remarks on Explosion Hazards	No additional remark.

Section VI. Accidental Release Measures

Small Spill	Try to stop the leak by closing process valves and isolation or tightening the flanges.
Large Spill	Poisonous gas. Flammable gas. Let evaporate. DO NOT touch or walk through spilled material. DO NOT direct water at spill or source. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas. Eliminate all sources of ignition. Vapors are heavier than air and may travel to a source of ignition and flash back.

Section VII. Handling and Storage

Precautions	Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. DO NOT ingest. Do not breathe gas, fumes, vapor or spray. In case of insufficient ventilation, wear a full-face supplied-air respirator or a self-contained breathing apparatus. If you feel unwell, seek medical attention and show the MSDS when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.
Storage	This is an intermediate refinery process stream at the Sulfur Recovery Unit. It is not strored in the refinery.

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Section VIII. Exposure Controls/Personal Protection

Engineering Controls	Ventilation is normally required when handling or using this product.
Personal Protection	Where the potential exists for exposure to Carbonyl Sulfide, either a full-face supplied air respirator or a self-contained breathing apparatus (SCBA) should be worn. Impervious Gloves, Suit, and Boots should also be worn.
Personal Protection in Case of a Large Spill	Full suit. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Where exposure to cold equipmnet, vapors, or liquid may occur, special clothing designed to prevent the freezing of the body tissues should be worn.
Exposure Limits	No occupational exposure limits have been established for carbonyl sulfide. **This does not mean that this substance is not harmful.** Safe work practices should always be followed. It should be recognized that Carbonyl Sulfide can be absorbed through the skin, thereby increasing exposure.

Section IX. Physical and Chemical Properties

Physical state and appearance	Gas. (Gas.)
Molecular Weight	60.07g/mole
pH (1% soln/water)	Not available.

Odor	Typical Sulfide odor except when pure.
Taste	Not available.
Color	Colorless gas .

Boiling Point	-50.2°C (-58.4°F)
Melting Point	-138.2°C (-216.8°F)
Critical Temperature	Not available.
Specific Gravity	1.028 (Water = 1)
Vapor Pressure	9412 mm of Hg (@ 20°C)
Vapor Density	2.1 (Air = 1)
Volatility	Not available.
Odor Threshold	Not available.
Evaporation rate	>1
Viscosity	Not available.
Water/Oil Dist. Coeff.	The product is more soluble in oil.
Ionicity (in Water)	Not available.
Dispersion Properties	See solubility in water, methanol, n-octanol.
Solubility	Soluble in methanol, n-octanol. Very slightly soluble in cold water, hot water.

Section X. Stability and Reactivity Data

Stability	The product is stable.
Instability Temperature	Not available.
Conditions of Instability	No additional remark.
Incompatibility with various substances	Extremely reactive or incompatible with oxidizing agents.
Corrosivity	Not available.
Special Remarks on Reactivity	No additional remark.
Special Remarks on Corrosivity	No additional remark.

Continued on Next Page

Section XI. Toxicological Information

Routes of Entry	Eye contact. Inhalation. Skin contact.
Toxicity to Animals	**WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.** Acute oral toxicity (LD50): 23 mg/kg (Rat). Acute toxicity of the gas (LC50): 1110 ppm (Rat)
Chronic Effects on Humans	No additional remark.
Other Toxic Effects on Humans	Extremely dangerous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Very dangerous in case of skin contact (permeator).
Special Remarks on Toxicity to Animals	No additional remark.
Special Remarks on Chronic Effects on Humans	No additional remark.
Special Remarks on other Toxic Effects on Humans	No additional remark.

Section XII. Ecological Information

Ecotoxicity	Not available.
BOD5 and COD	Not available.
Products of Biodegradation	No data available.
Toxicity of the Products of Biodegradation	No data available.
Special Remarks on the Products of Biodegradation	No additional remark.

Section XIII. Disposal Considerations

Waste Disposal	Recycle, if possible. Consult your local or regional authorities.

Section XIV. Transport Information

DOT	Not available.
Proper Shipping Name	Not available.
Hazard Class	DOT CLASS 2.3: Toxic Gas
Identification Number	UN2204
Packing Group	Not available.
Hazardous Substances Reportable Quantities	Not available.
Special Provisions for Transport	No additional remark.
Marine Pollutant	**Marine Pollutant (Pictograms)**
DOT (Pictograms)	

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Section XV. Other Regulatory Information and Pictograms

Federal Regulations

State Regulations

National Fire Protection Association (U.S.A.)

Health

Fire Hazard

Reactivity

Specific hazard

NFPA Hazard Ratings:

0 - Minimal
1 - Slight
2 - Moderate
3 - Serious
4 - Severe

Protective Clothing (Pictograms)

PPE DESCRIPTION:

See Section VIII for specific materials of PPE construction.

Section XVI. Other Information

References

-CHEMTOX Database, March 1997 Version, by Resource Consultants, Inc.
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
-(HSDB) Hazardous Substance Data Bank, from the National Library of Medicine
-Toxicology, Occupational Medicine, and Environmental Series (TOMES (R), Micromedex Inc. Computer Database)

Other Special Considerations

No additional remark.

Validated by SysAdm on 8/21/2007.

Verified by SysAdm.

Printed 8/21/2007.

Port Arthur Refinery Emergency Phone
(409) 985-2200 or X-2200

Port Arthur Refinery Shift Supv.
X-1738 or X-1265

Port Arthur Refinery MSDS Info:
(409)985-1240 or X-1200

Notice to Reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist

SAFETY DATA SHEET

1. Identification

Product identifier	**SULFUR DIOXIDE**
Other means of identification	Not available.
Recommended use	Not available.
Recommended restrictions	None known.

Manufacturer / Importer / Supplier / Distributor information

Manufacturer/Supplier	Valero Marketing & Supply Company and Affiliates One Valero Way San Antonio, TX 78269-6000
General Assistance	210-345-4593
E-Mail	CorpHSE@valero.com
Contact Person	Industrial Hygienist
Emergency Telephone	24 Hour Emergency 866-565-5220 1-800-424-9300 (CHEMTREC USA)

2. Hazard(s) identification

Physical hazards	Gases under pressure	Compressed gas
Health hazards	Acute toxicity, inhalation	Category 3
	Skin corrosion/irritation	Category 1
	Serious eye damage/eye irritation	Category 1
OSHA defined hazards	Not classified.	

Label elements

Signal word	Danger
Hazard statement	Contains gas under pressure; may explode if heated. Toxic if inhaled. Causes severe skin burns and eye damage.

Precautionary statement

Prevention	Do not breathe gas. Wear protective gloves/protective clothing/eye protection/face protection. Wash thoroughly after handling. Use only outdoors or in a well-ventilated area.
Response	If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center/doctor. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Storage	Store in a well-ventilated place. Keep container tightly closed. Store locked up.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC) Not classified.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Sulfur dioxide	7446-09-5	100

4. First-aid measures

Inhalation	Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Call a physician or poison control center immediately.
Skin contact	In case of contact, flush skin with plenty of water for 15 minutes. Remove contaminated clothing. Get medical attention.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.

Ingestion	Ingestion is not a typical route of exposure for gases or liquefied gases.
Most important symptoms/effects, acute and delayed	Contact with liquefied gas may cause frostbite.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.

5. Fire-fighting measures

Suitable extinguishing media	Water spray. Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use a solid water stream as it may scatter and spread fire.
Specific hazards arising from the chemical	Water used for fire extinguishing, which has been in contact with the product, may be corrosive.
Special protective equipment and precautions for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.
Fire-fighting equipment/instructions	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Withdraw immediately in case of rising sound from venting safety devices or any discoloration of tanks due to fire. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Move containers from fire area if you can do it without risk. In the event of fire, cool tanks with water spray. Cool containers exposed to flames with water until well after the fire is out. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Water runoff can cause environmental damage.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Avoid breathing gas. Do not get in eyes, on skin, on clothing. Keep unnecessary personnel away. Local authorities should be advised if significant spillages cannot be contained. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
Methods and materials for containment and cleaning up	Ventilate well, stop flow of gas or liquid if possible. Immediately contact emergency personnel.
Environmental precautions	Prevent further leakage or spillage if safe to do so. Prevent material from entering drains, sewers or low lying areas. See section 13 for waste disposal information.

7. Handling and storage

Precautions for safe handling	Wear appropriate personal protective equipment (See Section 8). Eating, drinking, and smoking should be prohibited in areas where this material is handled, stored, and processed. Do not breathe gas. Do not get in eyes, on skin, on clothing. Use only with adequate ventilation. Wash thoroughly after handling.
Conditions for safe storage, including any incompatibilities	Store in accordance with local, regional, national, and international regulations. Secure cylinders in an upright position at all times, close all valves when not in use. Store in a cool, dry, well-ventilated place. Keep container tightly closed and sealed until ready for use. Protect cylinders from damage.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Material	Type	Value
SULFUR DIOXIDE (CAS 7446-09-5)	PEL	13 mg/m3
		5 ppm

US. ACGIH Threshold Limit Values

Material	Type	Value
SULFUR DIOXIDE (CAS 7446-09-5)	STEL	0.25 ppm

US NIOSH Pocket Guide to Chemical Hazards: Recommended exposure limit (REL)

Material	Type	Value
SULFUR DIOXIDE (CAS 7446-09-5)	REL	5 mg/m3
		2 ppm

US NIOSH Pocket Guide to Chemical Hazards: Short Term Exposure Limit (STEL)

Material	Type	Value
SULFUR DIOXIDE (CAS 7446-09-5)	STEL	13 mg/m3
		5 ppm

Biological limit values No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. The engineering controls also need to keep gas, vapor, or dust concentrations below any lower explosive limits.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles) and a face shield. Wear a full-face respirator, if needed.

Skin protection

Hand protection Wear chemical-resistant, impervious gloves.

Other Wear protective clothing appropriate for the risk of exposure.

Respiratory protection If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn.

Thermal hazards Contact with liquefied gas might cause frostbites, in some cases with tissue damage.

General hygiene considerations Do not eat, drink or smoke when using the product. Wash thoroughly after handling. Provide eyewash station and safety shower. Handle in accordance with good industrial hygiene and safety practices.

9. Physical and chemical properties

Appearance Colorless gas.

Physical state Gas.

Form Gas.

Color Clear.

Odor Strong pungent.

Odor threshold Not available.

pH Not available.

Melting point/freezing point -103.9 °F (-75.5 °C)

Initial boiling point and boiling range Not available.

Flash point Not available.

Evaporation rate Not available.

Flammability (solid, gas) Not available.

Upper/lower flammability or explosive limits

Flammability limit - lower (%) Not available.

Flammability limit - upper (%) Not available.

Explosive limit - lower (%) Not available.

Explosive limit - upper (%) Not available.

Vapor density 2.263 at 0°C

Relative density Not available.

Solubility(ies) 100 g/l

Partition coefficient (n-octanol/water) Not available.

Auto-ignition temperature Not available.

Decomposition temperature Not available.

Viscosity Not available.

Other information

Dynamic viscosity 0.01 mPa.s

Dynamic viscosity temperature	64.4 °F (18 °C)
Molecular formula	SO2
Molecular weight	64.06 g/mol

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Stable under normal temperature conditions and recommended use.
Possibility of hazardous reactions	Polymerization will not occur.
Conditions to avoid	Avoid exposure to high temperatures or direct sunlight.
Incompatible materials	Alkalis. Moisture.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Ingestion	Not applicable.
Inhalation	Suffocation (asphyxiant) hazard - if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels.
Skin contact	Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling.
Eye contact	Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling.
Symptoms related to the physical, chemical and toxicological characteristics	Effects on exposure by inhalation may include sore throat, cough, burning sensation, shortness of breath and labored breathing.

Information on toxicological effects

Acute toxicity	Vapors are corrosive. After some hours, injured persons may develop serious shortness of breath and lung edema. Toxic by inhalation. Irritating to eyes, respiratory system and skin. High concentrations may cause severe irritation, pulmonary edema (body fluid in the lungs) with coughing, wheezing, and abnormal lung sounds.

Components	Species	Test Results
Sulfur dioxide (CAS 7446-09-5)		
Acute		
Inhalation		
LC50	Dog	400 ppm, 2 hours

Skin corrosion/irritation	Based on available data, the classification criteria are not met.
Serious eye damage/eye irritation	Based on available data, the classification criteria are not met.
Respiratory sensitization	Based on available data, the classification criteria are not met.
Skin sensitization	Based on available data, the classification criteria are not met.
Germ cell mutagenicity	Based on available data, the classification criteria are not met.

Carcinogenicity

IARC Monographs. Overall Evaluation of Carcinogenicity

Sulfur dioxide (CAS 7446-09-5)	3 Not classifiable as to carcinogenicity to humans.

Reproductive toxicity	Based on available data, the classification criteria are not met.
Specific target organ toxicity - single exposure	Based on available data, the classification criteria are not met.
Specific target organ toxicity - repeated exposure	Based on available data, the classification criteria are not met.
Aspiration hazard	Based on available data, the classification criteria are not met.
Chronic effects	May cause lung damage.

12. Ecological information

Ecotoxicity	Not expected to be harmful to aquatic organisms.
Persistence and degradability	No data available.
Bioaccumulative potential	No data available.
Mobility in soil	No data available.

Other adverse effects None known.

13. Disposal considerations

Disposal instructions Dispose in accordance with all applicable regulations. This material and its container must be disposed of as hazardous waste. Dispose of this material and its container to hazardous or special waste collection point. Do not discharge into drains, water courses or onto the ground.

Hazardous waste code Not regulated.

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number	UN1079
UN proper shipping name	Sulfur dioxide
Transport hazard class(es)	2.3
Subsidiary class(es)	8
Packing group	Not available.
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	3, B14, T50, TP19
Packaging exceptions	None
Packaging non bulk	304
Packaging bulk	314, 315

IATA

UN number	UN1079
UN proper shipping name	Sulfur dioxide
Transport hazard class(es)	2.3
Subsidiary class(es)	8
Packaging group	Not available.
Environmental hazards	No
Labels required	2.3, 8
ERG Code	Not available.
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number	UN1079
UN proper shipping name	Sulfur dioxide
Transport hazard class(es)	2.3
Subsidiary class(es)	8
Packaging group	Not available.
Environmental hazards	
Marine pollutant	No
Labels required	2.3, 8
EmS	Not available.
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable. This product is a compressed or liquefied gas and when transported in bulk is covered under IGC code.

15. Regulatory information

US federal regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - No
Pressure Hazard - Yes
Reactivity Hazard - No

SARA 302 Extremely hazardous substance Yes

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)
Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List
Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)
Sulfur dioxide (CAS 7446-09-5)

Safe Drinking Water Act (SDWA) Not regulated.

Food and Drug Administration (FDA) Not regulated.

US state regulations

US. Massachusetts RTK - Substance List
Sulfur dioxide (CAS 7446-09-5)

US. New Jersey Worker and Community Right-to-Know Act
Sulfur dioxide (CAS 7446-09-5) 500 lbs

US. Pennsylvania RTK - Hazardous Substances
Sulfur dioxide (CAS 7446-09-5)

US. Rhode Island RTK
Sulfur dioxide (CAS 7446-09-5)

US. California Proposition 65

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance
Sulfur dioxide (CAS 7446-09-5)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

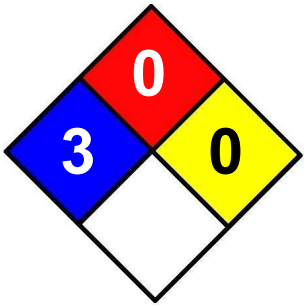
16. Other information, including date of preparation or last revision

Issue date 22-October-2013

Revision date -

Version # 01

NFPA Ratings



References

ACGIH
EPA: AQUIRE database
NLM: Hazardous Substances Data Base
US. IARC Monographs on Occupational Exposures to Chemical Agents
HSDB® - Hazardous Substances Data Bank
IARC Monographs. Overall Evaluation of Carcinogenicity
National Toxicology Program (NTP) Report on Carcinogens
ACGIH Documentation of the Threshold Limit Values and Biological Exposure Indices

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